Conveyor belt, belt conveyor system comprising same and use of the belt

The present invention relates to a closed-loop conveyor belt.

In numerous situations, it is necessary to transport products, such as granulates, agricultural products or mineral ores, through an expanse of water.

In order to do this, it is known to place, on the surface of the water, a succession of floating frames bound together in a row. These floating frames each comprise supporting means for a closed-loop conveyor belt.

The conveyor belt is held between two end rollers, which provide for its reversing. One of the rollers is a driving roller to provide for the driving of the belt.

Such conveyors work satisfactorily. Nevertheless, their structure is relatively complex, so that their manufacture and their installation are awkward and costly.

The object of the invention is to propose a conveyor which is simple to manufacture and install.

To this end, the subject of the invention is a conveyor belt of the aforesaid type, characterized in that it comprises, in its center part, a continuous support area and, at the side, at least one longitudinal buoyancy tube.

According to particular embodiments, the belt comprises one or more of the following characteristics:

- the or each buoyancy tube is integrated in the thickness of the belt;
- the or each buoyancy tube forms an individual annular closed space extending along the whole of the circumference of the belt;
- the or each closed space is maintained at a pressure ranging between 1 bar and 5 bar;
- it comprises a buoyancy tube along each longitudinal edge of the belt;

- the buoyancies conferred to the belt by the two longitudinal buoyancy tubes are different;

- the cross sections of the two longitudinal buoyancy tubes are different;

- it comprises, on at least one face, transverse ribs distributed along at least a part of the circumference of the belt; and

- it comprises transverse ribs on its two opposite faces.

Also forming the subject of the invention is a conveyor comprising a belt such as described above and two remote belt-reversing units between which the belt is held, each reversing unit comprising a reversing roller around which the belt is engaged.

According to one particular embodiment, the conveyor comprises the following characteristic:

- each reversing unit comprises lateral spacing means for the two belt strands emanating from the same reversing roller.

The subject of the invention is also formed by a materials-transporting process, characterized in that it comprises steps consisting in: rotating a belt such as described above directly on the surface of an expanse of liquid, and disposing the materials to be transported on the upper support area of the belt floating on the surface of the expanse of liquid.

Finally, the subject of the invention comprises a recovery process for a floating substance, especially oil, on the surface of an expanse of liquid, characterized in that it comprises the rotation of a belt such as described above with a first edge only partially submerged and the second side edge totally submerged.

The invention will be better understood from a reading of the following description, provided solely by way of example and rendered with reference to the drawings, in which:

- figure 1 is a diagrammatic top view of a conveyor according to the invention;

- figure 2 is a cross-sectional view of the belt of the conveyor of figure 1 taken along the line 2-2;

- figure 3 is a larger-scale sectional view of a side edge of the belt;

- figures 4 and 5 are larger-scale views, respectively from the side and above, of one end of the conveyor;

- figure 6 is a view identical to that of figure 3, illustrating a manufacturing phase of the belt; and

- figures 7 and 8 are views identical to figures 1 and 2 of an embodiment of a conveyor according to the invention.

In figure 1, a conveyor 10 according to the invention is represented. This conveyor is installed between two opposite banks 12A, 12B of an expanse of water, such as a lake 14.

The conveyor essentially comprises a floating conveyor belt 16, which is closed in a loop to form a continuous belt, and two reversing units 18A, 18B disposed at each of the ends of the conveyor on the banks 12A and 12B.

As illustrated in figure 2, the belt 16 has, in its center part, a continuous support area 20 for the products to be transported and, laterally, on each of the edges, longitudinal buoyancy tubes 22. The tubes 22 extend along the entire length of the continuous belt and are integrated in the thickness of this belt.

The tubes 22 have a, for example, substantially circular internal section. For a belt of a width ranging between 1 m and 4 m, the diameter of the tubes 22 ranges between 10 cm and 50 cm.

The tubes 22 extend along the entire length of the closed-loop belt and thus define an annular closed space 24. This closed space is filled with a gas such as air at a pressure ranging between 1 bar and 5 bar and advantageously of the order of 2 bar.

The structure of the belt 16 is represented in greater detail in figure 3. This belt comprises two inner reinforcing layers 26 extending along the whole

of the surface of the belt. These layers 26 are encased in an elastic material 28 such as vulcanized rubber.

The two layers 26 extend on either side of the tubes 22.

The tube 22 is delimited by an impermeable tubular membrane 30 forming a lining delimiting, for each tube, an individual gas-tight pocket. The membrane 30 is accommodated in the thickness of the belt.

A reversing unit 18A, provided at the end of the conveyor, is illustrated on a larger scale in figures 4 and 5.

This unit comprises a reversing roller 40 rotatably mounted on a portal 42, itself placed on the ground, where it is anchored. The portal 42 is fixed, for example, to a socle 44.

The belt 16 is engaged around reversing rollers. The tension of the belt between two end reversing units is such that the buoyancy tubes 22 are compressed and flattened in the region of the belt engaged around the reversing rollers 40.

One of the rollers 40 is equipped with drive means by which it can be set in rotation and by which the belt 16 can be driven.

As illustrated in figure 5, the end reversing units 18A comprise lateral spacing means 50 for the two belt strands. Thus, the upper and lower strands of the belt engaged around the reversing roller 40 are laterally offset on either side of the longitudinal axis of the conveyor.

The reversing units 18A, 18B are such that the faces of the belt in contact with the liquid are opposite along the upstream strand and the downstream strand of the belt.

As illustrated in figures 1 and 2, the two strands of the belt are in this case adjacent in the running part of the conveyor and extending in a same plane to the surface of the water.

The spacing means 50 are formed, for example, by guide cradles for each of the belt strands. These

cradles are fit for supporting the belt and for providing for its lateral offsetting. To this end, they are staggered, each on one side of the longitudinal axis of the conveyor, and are inclined toward the outside of the conveyor.

In figure 2, the featured transporting strand 16A has its central support area 20 laden with products, so that this strand, resting directly on the surface of the water, forms a basin. The two side edges of the belt are held out of the water by longitudinal buoyancy tubes 22.

By contrast, the unladen return strand 16B floats substantially flat on the surface of the water.

In operation, therefore, the two strands of the belt are supported along the entire length of the conveyor, floating directly on the surface of the water without any external means of support being necessary.

It will be recognized that such a conveyor is simple to make and to use.

Such a conveyor can be used even in a zone initially devoid of an expanse of water. In this case, in order to allow the installation of the conveyor, it is advisable to create a shallow channel, for example of the order of one-meter in depth, and to fill this channel with water. The two belt strands are applied to the surface of the water contained in the channel.

The belt 16 is manufactured according to the following process.

Firstly, a belt blank is produced. This blank is constituted, as illustrated in figure 6, by a plane belt which is not yet closed in a loop. This belt comprises the two layers 26. On the longitudinal edges of the belt there is disposed, between the two layers 26, the tubular membrane 30 intended to delimit the buoyancy tubes. This membrane is then flattened. The two layers 26 and the membranes 30 are encased in the rubber 28. The latter is then vulcanized.

The plane belt is then closed in a loop and its two ends are joined together. In particular, the ends

of the tubular membranes 30 are joined end to end to form the annular closed spaces.

Advantageously, supplementary reinforcing belts are added in the connecting region of two ends of the plane belt blank.

After the two ends of the belt have been joined together, both buoyancy tubes are inflated by the introduction of pressurized air through a temporary orifice. The orifice is then plugged.

According to one embodiment, illustrated in figures 7 and 8, the featured belt 116 is held between two remote ships 118A, 118B on which the reversing units are mounted. The ships 118A, 118B are kept at a distance apart to ensure sufficient tension in the belt, with its two featured strands 116A, 116B extending side by side on the surface of the water.

This belt comprises two buoyancy tubes 122A, 122B of different dimensions, so that, as illustrated in figure 8, when the belt rests on the surface of the water, one of the longitudinal edges of the belt is partially submerged, whereas the other is held above the surface of the water.

For example, for a belt 1 m to 5 m in width, the tube 122A providing the greater buoyancy has a diameter ranging between 10 cm and 50 cm, whereas the tube 122B providing a lesser buoyancy has a diameter ranging between 5 cm and 20 cm.

Advantageously, the tube 122B is ballasted, for example, with a lead wire inserted in the thickness of the belt so as to confer a required level of buoyancy.

Additionally the belt comprises, in its central support area, and advantageously along its two faces, evenly distributed, built-on crosspieces 130. These crosspieces extend along the entire width of the belt from one buoyancy tube to the other.

It will be appreciated that, when the belt is displaced, one of the strands 116A is partially submerged, so that it is likely to collect substances floating on the surface of the water and to direct

these to a ship situated downstream, bearing in mind the direction of displacement of the strand 116A.

Such a conveyor can be used, in particular, to collect oil slicks floating on the surface of the sea following the wreck of a transport ship.